

A New *Woodsia* Hybrid From Kansas

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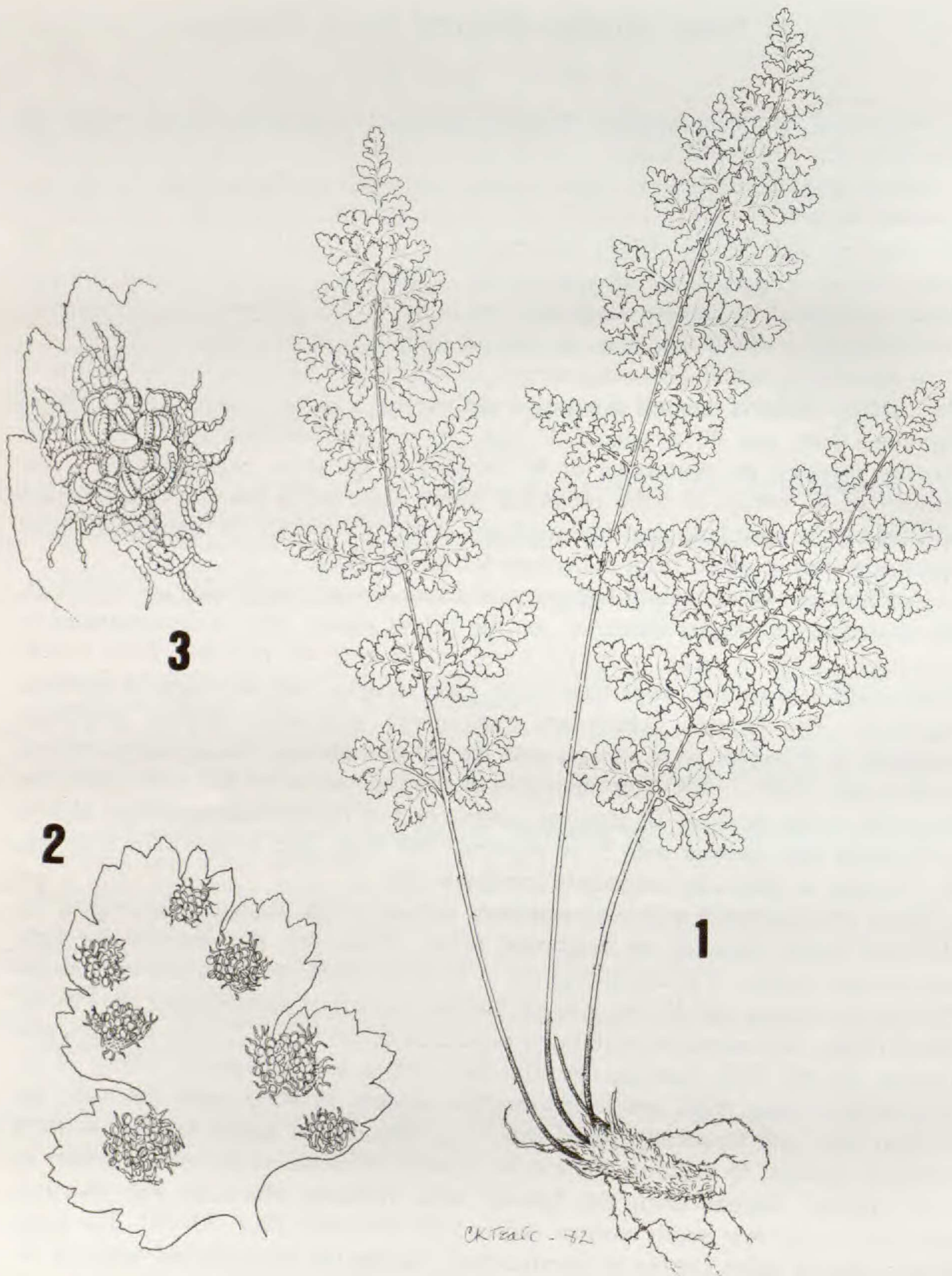
Woodsia R. Br. is a genus of about 25 species distributed worldwide except for Australia and Antarctica (Brown, 1964). Rosendahl (1915) was the first to describe a hybrid *Woodsia* (*alpina* × *ilvensis*) from specimens collected near Stockholm, Sweden. Butters (1941) reported *W. cathcartiana* (= *W. oregana* var. *cathcartiana*) × *ilvensis* and Tryon (1948) reported both *W. glabella* × *ilvensis* and *W. cathcartiana* × *scopulina*, all from southern Minnesota or southwestern Ontario. Thus, compared to genera such as *Asplenium* or the promiscuous *Dryopteris*, hybridization would appear to be an unusual event among woodsias.

In June 1976, while collecting along a sandstone outcrop in an upland prairie in the Smoky Hills of central Kansas, I discovered a mixed colony of *W. obtusa* (Spreng.) Torr. and *W. oregana* D.C. Eat. var. *oregana*. A thorough search of the outcrop revealed an abundance of *W. oregana* in the drier, exposed sites, a fair number of *W. obtusa* in more protected, mesic sites, and a few individuals which appeared to be morphological intermediates of the two species. A limited sample of specimens was removed from the colony for further study.

Examinations of the hybrid and parental plants revealed morphological intermediacy occurring in several characters on the hybrid plants. This is demonstrated by polygonal graphs of mean values for six characters (Fig. 4), including frond length, blade width and texture, stipe base color, stipe vestiture, and the shape of indusium segments. The indusia, which are traditionally used as a primary diagnostic character in *Woodsia*, were viewed with the aid of a Phillips 501 scanning electron microscope (Figs. 5–10). The indusia of *W. obtusa* consist of 4–6 wide, plate-like segments while those of *W. oregana* consist of 5–9 filamentous segments. Hybrid individuals have indusia with 5–10 segments that were each several cells wide and 2–3-furcate or otherwise irregularly lobed apically.

Spore characteristics were also examined with the SEM. Brown (1964) stated that *Woodsia* spores were of no diagnostic value. While this may be true for light microscope studies, it would appear not to be so for SEM work. Surface ornamentation for *W. obtusa* and *W. oregana* in Kansas, as well as several other sites in the Great Plains, are consistent with those illustrated herein (Figs. 11–16). Of particular interest are the walls forming the reticulate surface in each species. Those of *W. obtusa* are 3–4 μm high and form complete areoles. In *W. oregana* the walls are 1–2 μm high and frequently “dead end,” i.e. they do not always connect to form complete areoles. In addition, there is an obvious difference in the surface texture in each species. Spores from the hybrids were typically abnormal and abortive, although a very few nearly normal spores were observed (Figs. 13–14). The latter spores display some degree of intermediacy, having the disconnected walls of *W. oregana* and surface texture of *W. obtusa*.

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FIGS. 1-3. Holotype of *Woodsia* \times *kansana*, Brooks 12259d (KANU). FIG. 1. Habit. FIG. 2. Pinna. FIG. 3. Sorus.

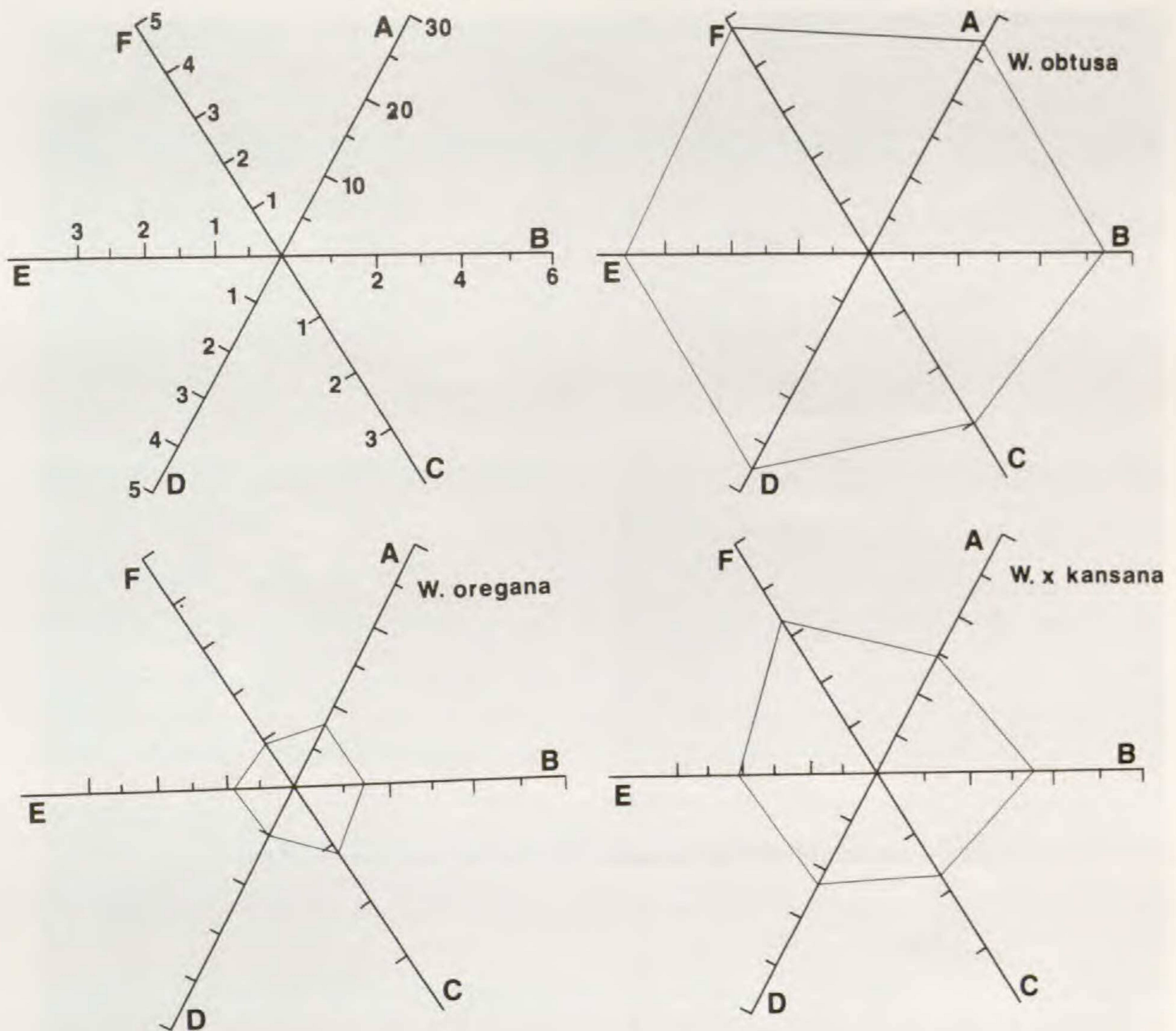


FIG. 4. Polygonal graphs of mean values of six characters for central Kansas Woodsias. The abbreviations are: A = frond length (cm), B = frond width (cm), C = blade texture (coriaceous to membranaceous), D = stipe base color (dark reddish brown to stramineous), E = stipe vestiture (lacking scales to scaly), and F = indusium segments (filamentous to wide and plate-like).

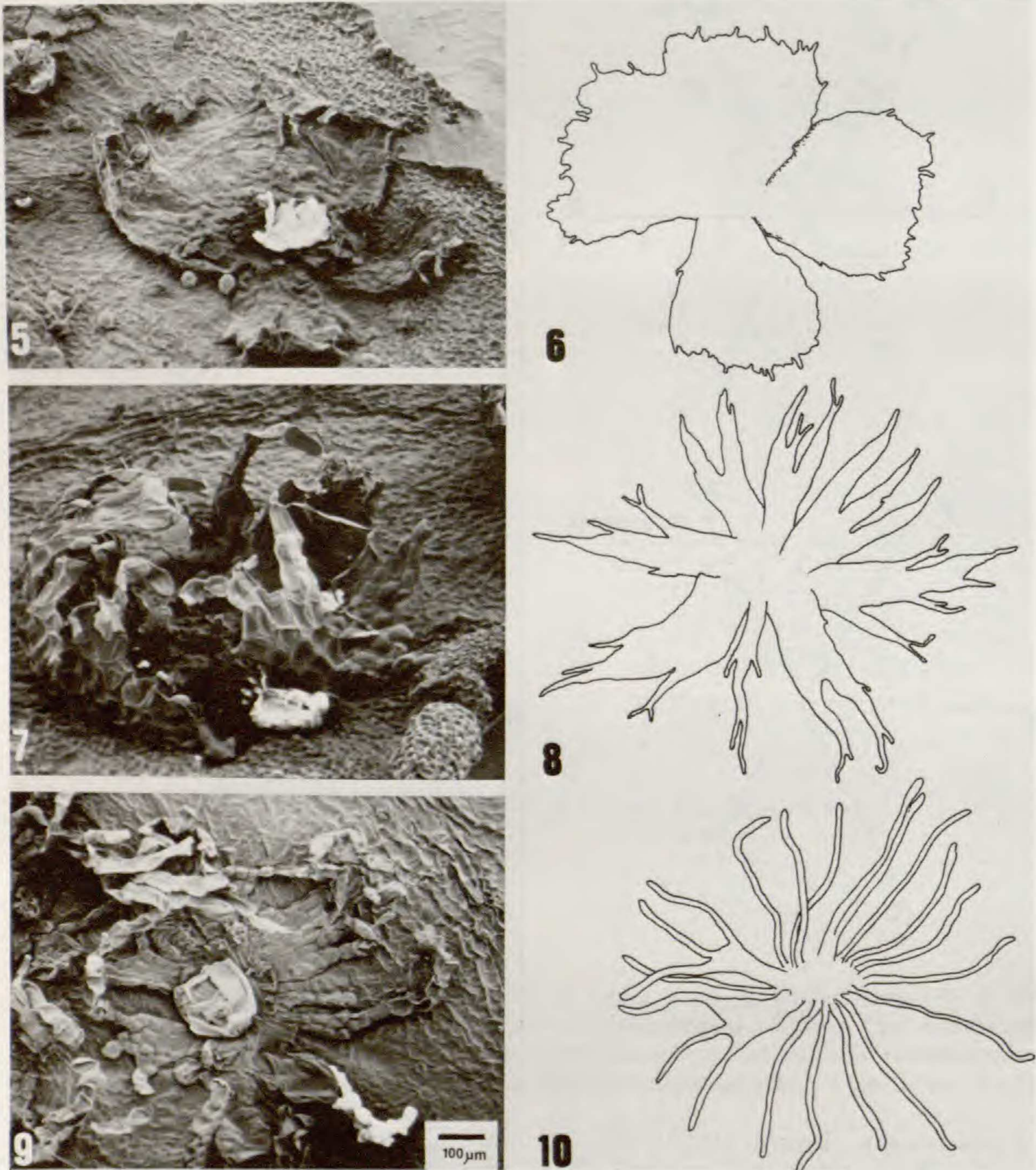
Cytologically, Brown (1964) indicates that *W. obtusa* is a tetraploid, $n=76$, probably derived from *W. oregana*, $n=38$. A firm chromosome count has not been established for the hybrid plants. However, my colleague Dr. Christopher Haufler has observed meiotic irregularities, as one might expect given the differences in chromosome numbers of the parental species.

The morphological intermediacy, spore morphology, and meiotic irregularities fulfill the criteria for hybridity as outlined by Wagner and Chen (1965). Therefore recognition of this new hybrid is set forth in the following diagnosis and description.

***Woodsia* × *kansana* R. E. Brooks, hybr. nov.**

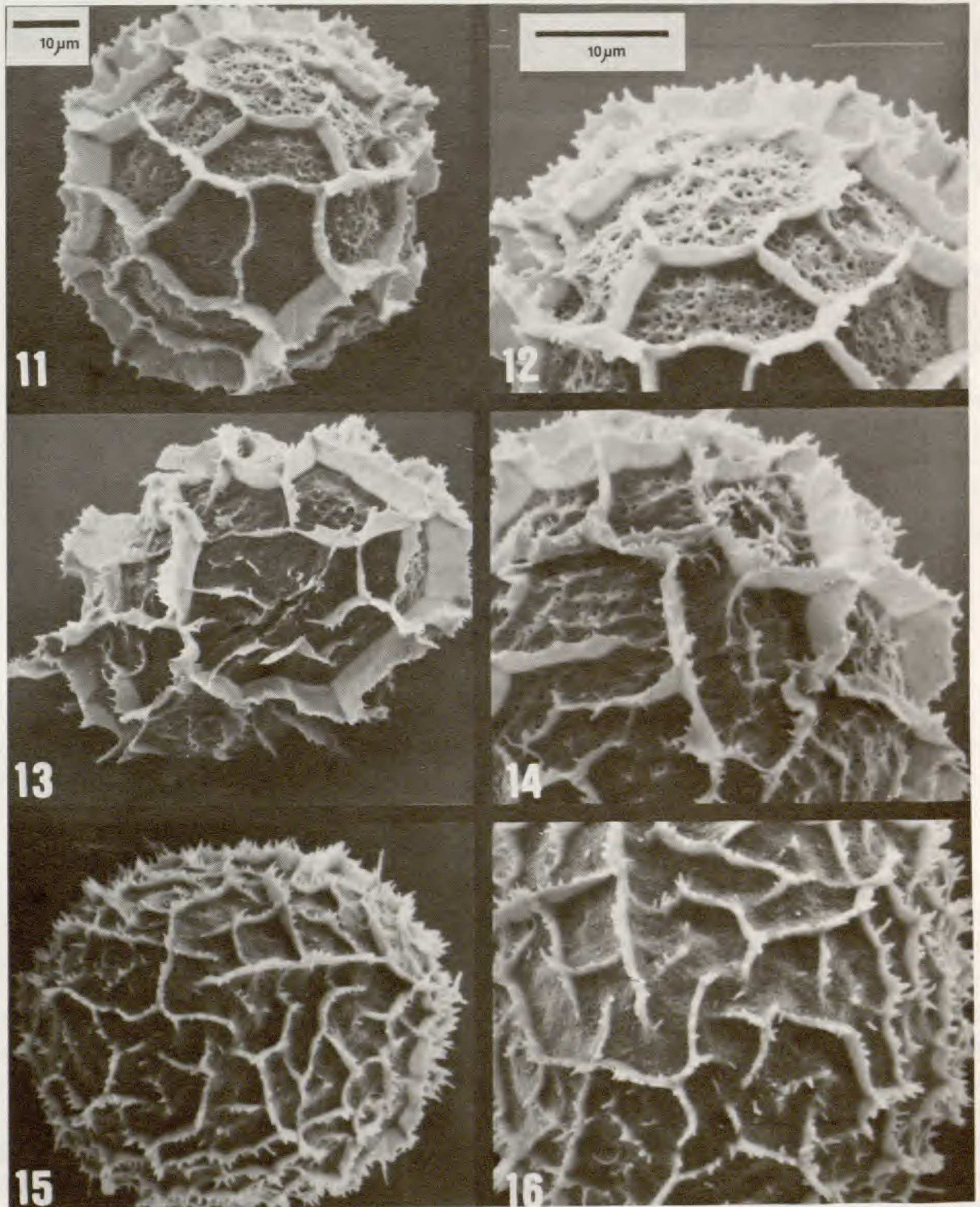
Figs. 1–3, 7, 8.

Laminae inter parentes *W. obtusam* et *W. oreganam* var. *oreganam*. Indusia 5–10 segmentis; composita segmentis pluribus cellulis latis, apicibus 2–3-furcatis vel irregulariter lobatis. Sporae abnormales et abortivae.



FIGS. 5-10. Photomicrographs and interpretive drawings of *Woodsia indusia*.
 FIGS. 5-6. *W. obtusa*. FIGS. 7-8. *W. ×kansana*. FIGS. 9-10. *W. oregana*.

Plants morphologically intermediate between *W. obtusa* and *W. oregana*. Rhizomes to 4 cm long, 2-4 mm in diam; scales brownish with a darker, thicker median stripe, lanceolate, 2-5 mm long, entire. Fronds 1-2 dm tall; blade coriaceous to subcoriaceous, lanceolate to narrowly ovate, pinnate-pinnatifid or bipinnate, 6.5-12 cm long, 2.5-4 cm wide, glabrous or sparsely glandular, apex acute; pinnae subopposite to alternate, deltoid to ovate, apex acute to obtuse, short petiolate or sessile; ultimate segments oblong or ovate, apex obtuse to rounded, margins



FIGS. 11–16. Ornamentation of *Woodsia* spores. FIGS. 11–12. *W. obtusa*.
 FIGS. 13–14. *W. xkansana*. FIGS. 15–16. *W. oregana*.

mostly slightly reflexed and entire to serrate; petiole dark reddish brown at the base and becoming stramineous above or infrequently all stramineous, scales few, pale brownish, lanceolate, and membranaceous. Sori medial, discrete, sometimes appearing confluent with age, roundish; indusium basal with 5–10 segments; segments several cells wide, apex 2–3-furcate or otherwise irregularly lobed; spores mostly abnormal and abortive.

TYPE: KANSAS. McPherson Co.: 2 mi west and 2 mi south of Marquette, east facing sandstone outcrops along a high prairie ridge, 25 June 1976, *Ralph Brooks 12259d* (KANU; isotypes MICH, NY).

Associated with its parents *W. obtusa* and *W. oregana* var. *oregana* on sandstone outcrops. Known only from central Kansas (McPherson and Ellsworth counties, perhaps others in vicinity).

PARATYPE: Wilson, Ellsworth Co., Kansas, 1928, *Clement Weber 2* (MO).

The habit drawing is the work of Carol Kuhn Teale, a graduate student in botany at the University of Kansas.

LITERATURE CITED

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REVIEW

The Genus *Polypodium* in Cultivation [Polypodiaceae], by Barbara Joe Hoshizaki. *Baileya* 22:1-52, 53-99. June 1982.—This long work continues Barbara Joe's invaluable series on cultivated ferns. A key to subgenera and keys to the species in each subgenus lead to pertinent synonymy, a brief description, the native range, and horticultural notes for each species. Cultivated varieties are fully discussed under each species and also are illustrated. The taxa are illustrated by a silhouette of a frond or sometimes by a photograph. Occasionally a line drawing or silhouette of some detail is also provided, for instance, of a rhizome scale where that is diagnostic. Addenda and an index conclude the paper. In the addenda, the synonym *Pleopeltis revoluta* (Spreng. ex Willd.) A. R. Smith should be added to *Polypodium astrolepis*. Also, *Polypodium revolutum* C. Chr. appears to be a *nomen nudum*; the species apparently does not have a valid name. Under subgenus *Niphidium*, the name *Polypodium albopunctatissimum* Linden is mentioned as if it were a valid name, but it, too, is a *nomen nudum*. All who need to know or to identify cultivated polypodiums will make use of this paper constantly.—*D.B.L.*